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U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES

RAG-13902/08

DESIGNATED/ELECTED OFFICE (DO/EO/US)

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 1.5)

CONCERNING A FILING UNDER 35 U.S.C. 371

10/031694

INTERNATIONAL APPLICATION NO.

INTERNATIONAL FILING DATE

PRIORITY DATE CLAIMED

PCT/EP00/06384

6 July 2000

21 July 1999

TITLE OF INVENTION

FIXING ELEMENT FOR FIXING CORRUGATED TUBES TO A SUPPORT PART



APPLICANT(S) FOR DO/EO/US

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25006

PATENT TRADEMARK OFFICE

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (24) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
 - a. ☐ is attached hereto (required only if not communicated by the International Bureau).
 - b. ☒ has been communicated by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
 - a. ☒ is attached hereto.
 - b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
 - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
 - b. ☐ have been communicated by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
10. ☒ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☒ A copy of the International Search Report (PCT/ISA/210).

Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☒ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
20. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
21. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
22. ☒ Certificate of Mailing by Express Mail
23. ☒ Other items or information:

EL 867755288US

Postcard

24. The following fees are submitted

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :

- ☐ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO \$1040.00
- ☒ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$890.00
- ☐ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$740.00
- ☐ International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$710.00
- ☐ International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00

ENTER APPROPRIATE BASIC FEE AMOUNT =**CALCULATIONS PTO USE ONLY**

\$890.00

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e))

\$0.00

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE
Total claims	- 20 =	0	x \$18.00
Independent claims	- 3 =	0	x \$84.00

\$0.00

\$0.00

Multiple Dependent Claims (check if applicable) ☐

\$0.00

TOTAL OF ABOVE CALCULATIONS =

\$890.00

☐ Applicant claims small entity status See 37 CFR 1.27. The fees indicated above are reduced by 1/2.

\$0.00

SUBTOTAL =

\$890.00

Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)) +

\$0.00

TOTAL NATIONAL FEE =

\$890.00

Fee for recording the enclosed assignment (37 CFR 1.21(h)) The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). ☒

\$40.00

TOTAL FEES ENCLOSED =

\$930.00

Amount to be:	\$
refunded	
charged	\$

- a. ☒ A check in the amount of \$930.00 to cover the above fees is enclosed.
- b. ☐ Please charge my Deposit Account No _____ in the amount of _____ to cover the above fees.
A duplicate copy of this sheet is enclosed
- c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No 07-1180 A duplicate copy of this sheet is enclosed.
- d. ☐ Fees are to be charged to a credit card **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO

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(248) 647-6000

SIGNATURE

Thomas E. Anderson

NAME

31,318

REGISTRATION NUMBER

DATE

1/22/02

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Friedrich Silbereisen et al.

Serial No.:

Filed:

For: FIXING ELEMENT FOR FIXING CORRUGATED TUBES
TO A SUPPORT PART

PRELIMINARY AMENDMENT

Box PCT
Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

Prior to the examination of this application, please amend the application as follows:

IN THE ABSTRACT:

Please delete the abstract at the end of the application and replace it with the following new abstract:

Abstract

The invention relates to a fixing element for fixing a corrugated tube to a support part. The fixing element is connectable to the support part by a leg and includes engaging members that engage undercuts formed in the corrugated tube. The fixing element includes a leg, a guiding rail and a slide. The slide is insertable into the guiding rail and has a retainer lock that tapers in the direction of insertion. Engaging edges that are symmetrically arranged toward each other are formed on a side wall of the guiding rail and on the retainer lock surface opposite the wall. The engaging edges engage undercuts on the corrugated tube. The distance between the

edges is reduced when the slide is inserted in the guiding rail. The action of the retainer lock allows the fixing edges to be firmly pressed in the undercuts of the fixing ridge. It is therefore also possible to secure on a support part a corrugated tube with a reduced diameter and accordingly reduced engaging surfaces at the undercuts.

IN THE SPECIFICATION:

Please replace the specification with the substitute specification submitted herewith.

IN THE CLAIMS:

Kindly cancel claims 1-6.

Please insert new claims 7-19 as follows:

1 7. (New) A fixing element for fixing a corrugated tube to a support part,
2 said fixing element being connected to said support part by a leg and having at least
3 two engaging members engageable with at least two undercuts provided on said
4 corrugated tube, said fixing element comprising:

5 a guiding rail connected to said leg, said guiding rail having a first side wall,
6 said first side wall having an engaging edge; and

7 a slide displaceably secured on said guiding rail, said slide having a retainer
8 lock arranged on said slide and tapered in an inserting direction, said retainer lock
9 having a retainer lock surface including an engaging edge that is positioned opposite
10 to said engaging edge of said guiding rail, said engaging edge of said guiding rail and
11 said engaging edge of said first side wall being directed toward one another in a

12 mirror-inverted fashion and being engageable with said at least two undercuts of said
13 corrugated tube, a distance between said engaging edges being reduced when said
14 slide is moved on said guiding rail in an inserting direction.

1 8. (New) The fixing element according to claim 7, wherein said slide
2 includes a disengaged position in which said slide is partially pulled out of said
3 guiding rail and said distance between said engaging edges is the greatest, and an
4 engaged position in which said slide is inserted into said guiding rail and said distance
5 between said engaging edges is reduced.

1 9. (New) The fixing element according to claim 8, wherein said guiding
2 rail further comprises a base, a second side wall, at least two guiding surfaces for said
3 slide and an engaging tab, said engaging tab having an upwardly directed locking tab,
4 said locking tab being adapted to elastically engage a front notch and a rear notch
5 provided on an underside of said slide at a distance from one another, said front notch
6 defining said disengaged position of said slide and said rear notch defining said
7 engaged position of said slide.

1 10. (New) The fixing element according to claim 9, wherein said slide
2 further comprises a flat base part, and said retainer lock includes an outer retainer lock
3 surface and an inner retainer lock surface, said outer retainer lock surface and said
4 inner retainer lock surface being adapted to slidably engage said at least two guiding
5 surfaces of said guiding rail, one of said at least two guiding surfaces being formed on
6 one side of guiding rail by said second side wall and one of said at least two guiding

7 surfaces being forming on another side of said guiding rail by a step of said first side
8 wall.

1 11 (New) The fixing element according to claim 10, wherein said guiding
2 rail further comprises a first rectangular groove formed underneath said step of said
3 first side wall and a second rectangular groove formed in said second side wall and
4 said slide includes a first and a second guiding ridge that laterally protrude from a
5 base part of said slide, said first guiding ridge being adapted to slidably engage said
6 first rectangular groove and second guiding ridge being adapted to slidably engage
7 said second rectangular groove.

1 12. (New) The fixing element according to claim 10 wherein said at least
2 two guiding surfaces for said slide are formed on said side walls of said guiding rail
3 and extend transversely in reference to a center line of a base of said guiding rail, and
4 said slide includes a base part that transversely extends at a same angle as said
5 guiding surfaces, and said engaging edge of said retainer lock surface and said
6 engaging edge of said guiding rail form one guiding surface for said base part of said
7 slide and extend parallel in reference to said center line of said base of said guiding
8 rail.

1 13. (New) A fixing element for fixing a corrugated tube having at least two
2 undercuts to a support part comprising:

3 a body having a guiding rail and a leg, said guiding rail having a side wall that
4 includes an engaging edge; and

5 a slide moveably mounted on said guiding rail, said slide having a base and a
6 retainer lock, said retainer lock having a surface that includes an engaging edge, said
7 engaging edge of said guide rail and said engaging edge of said slide being adapted to
8 engage said at least two undercuts of said corrugated tube.

1 14. (New) The fixing element of claim 13, wherein said guiding rail
2 further comprises an engaging tab.

1 15 (New) The fixing element of claim 14, wherein said slide further
2 comprises at least one notch, said notch being adapted to be engaged by said engaging
3 tab.

1 16. (New) The fixing element of claim 13, where said guiding rail further
2 comprises at least two guiding surfaces for slidably supporting said slide.

1 17. (New) The fixing element of claim 16, where said slide further
2 comprises at least two guiding ridges, said at least two guiding ridges extending
3 laterally from said base part and being adapted to slidably engage said at least two
4 guiding surfaces of said guiding rail.

1 18. (New) A fixing element for a corrugated tube comprising:
2 a body having a guiding rail and a leg, said guiding rail having a side wall and
3 an engaging tab, said side wall having including an engaging edge; and

4 a slide moveably mounted on said guiding rail, said slide having a base, an
5 underside and a retainer lock, said underside including a front and a rear notch, said
6 retainer lock having a surface that includes an engaging edge, said engaging edge of
7 said side wall and said engaging edge of said surface or said retainer lock being
8 adapted to engage a corrugated tube

9 whereby said front notch is engaged by said engaging tab in a disengaged
10 position wherein said slide is partially pulled out of said guiding rail and a distance
11 between said engaging edges is greatest and whereby said rear notch is engaged by
12 said engaging tab in an engaged position wherein said slide is inserted into said
13 guiding rail and said distance between said engaging edges is reduced.

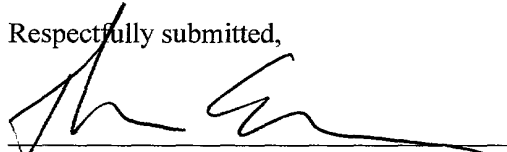
REMARKS

Applicant respectfully requests that the above-identified application be amended to delete claims 1-6 and insert new claims 7-18. Additionally, Applicant submits herewith a clean version of a substitute specification and a marked-up version of the specification as filed. This substitute specification includes no new matter.

If the Examiner has any questions regarding this application, Applicant's attorney may be reached at (248) 647-6000.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version with Markings to Show Changes Made."

Respectfully submitted,



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MDS/gs
Enclosures

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE ABSTRACT:

A new abstract has been added to replace the one originally filed.

IN THE SPECIFICATION:

The specification has been replaced with the substitute specification submitted herewith. A marked-up specification is also submitted herewith.

IN THE CLAIMS:

Claims 1-6 have been canceled.

New claims 7-18 have been added.

10031694-0123
531 Rec'd PCT/PTC 22 JAN 2002

**FIXING ELEMENT FOR FIXING
CORRUGATED TUBES TO A SUPPORT PART**

[Description] Background of the Invention

Field of the Invention

5 The invention pertains to a fixing element for fixing corrugated tubes to a support part[, wherein the]. The fixing element [can be connected] is connected to the support part by [means of] a fixing leg[, and [wherein the fixing element contains] includes engaging members that [can be engaged with] engage undercuts provided on the corrugated tube.

10 **Reference to Related Art**

Corrugated tubes [serve, for example, for accommodating] are often used in the installation of electric lines or bundles of cables that [should] extend or [be] are installed along a support part. Due to the design [which is in the form of a] of the corrugated tube[, (i.e., a tube with uniformly spaced apart

15 circular grooves or ribs in its outer surface), the tubes [of this type] are very flexible such that a bundle of cables can be arbitrarily installed in a space-saving fashion[, e.g., such that it]. For example, the tube may be installed such that it follows the shape of a support part[, while being covered and protected].

In order to fix a corrugated tube with a bundle of cables situated therein at its

20 intended location, [it] the tube needs to be fixed to the support part [in question within] at certain intervals. For this purpose, the ribbed outer surface of the corrugated tube is[, for example,] typically provided with two undercuts that extend parallel to one another in the longitudinal direction in a mirror-inverted fashion[, wherein fixing]. Fixing elements are then arranged on the support

part [within] at certain intervals [are able to engage behind said undercuts] and
are engageable with the undercuts of the tube.

Corrugated tubes of this type are available with various diameters. In
corrugated tubes with a relatively small diameter and an accordingly thin wall,
5 the above-mentioned undercuts also are relatively small such that they only
provide a small engaging surface for a fixing clamp [and the connection may
not appear sufficiently secure]. Therefore the connection between the
undercuts of the corrugated tubes and the fixing element may not be
sufficiently secure to ensure proper installation of the tube.

10 Summary of the Invention

The invention [is based on the objective of developing] is directed to a
fixing element [for reliably fixing, in particular,] for securely and reliably
attaching corrugated tubes [with] having a relatively small diameter and
undercuts (with an accordingly small depth) to a support part.

15 According to the invention, [this objective is attained due to the fact
that] there is disclosed a fixing element having a guiding rail that is rigidly
connected to the fixing leg of the fixing element[, wherein a]. A slide with a
retainer lock [that] is tapered in the inserting direction and rigidly arranged on
the slide and can be displaced in [said] the guiding rail[, wherein engaging].
20 Engaging edges that extend toward one another in a mirror-inverted fashion are
formed on one side wall of the guiding rail and on the retainer lock surface of
the retainer lock which is situated opposite to the aforementioned side wall of
the guiding rail[, wherein said]. The engaging edges [can be engaged] are

engageable with undercuts on the corrugated tube to be fixed [which]. The undercuts extend parallel to one another in the longitudinal direction in a mirror-inverted fashion[, and wherein the]. The distance between the engaging edges is reduced when the slide is inserted into the guiding rail.

5 The slide can preferably assume two positions in the guiding rail. [The] A disengaged position is characterized by the slide being partially pulled out of the guiding rail and the distance between the engaging edges being at its greatest. [The] An engaged position is characterized by the slide being inserted into the guiding rail and the distance between the engaging edges being
10 reduced.

 In the disengaged position of the slide, the undercuts of the corrugated tube to be fixed [which extend parallel to one another in the longitudinal direction] are engaged with the [correspondingly spaced apart] engaging edges that are integrally formed onto one side wall of the guiding rail and the
15 opposing retainer lock surface of the retainer lock. [When] Preferably, when the slide is inserted into the guiding rail, the distance between the two engaging edges is reduced (due to the wedge effect of the retainer lock arranged on the slide) such that the engagement with the undercuts on the corrugated tube is tightened and a secure retention of the corrugated tube is [also] ensured [if the
20 engaging surface on the undercuts is relatively small].

 [The] Preferably, the guiding rail contains bottom and side walls with guiding surfaces for the slide. An engaging tab that is slightly bent upward and contains an upwardly directed locking tab is advantageously formed on the

base of the guiding rail by means of recesses[, wherein said]. Preferably, the
engaging tab can be elastically engaged with notches provided on the underside
of the slide [at a distance from one another which defines] which defined the
disengaged position [of the slide and at a distance from one another which
5 defines] and the engaged position of the slide. [Due to this measure]
Therefore, the slide is held in the guide rail in a captive fashion in its
disengaged position and locked in its engaged position such that an
unintentional disengaging of the corrugated tube from the fixing element is
prevented.

10 According to [one] a preferred embodiment of the invention, the slide
[consists of] has a flat base part that carries the retainer lock on its upper side.
The slide is guided on guiding surfaces formed by the side wall of the guiding
rail on one side and by a step of the side wall of the guide rail on the other side
by [means of] an outer retainer lock surface and an inner lateral surface of its
15 base part.

The slide is preferably guided on one side in a rectangular groove
formed in the side wall and on the other side in a rectangular groove formed
underneath the step, namely by [means of] guiding ridges that laterally
protrude from the base part.

20 [According to one preferred embodiment of the invention, the] The
guiding surfaces for the slide (which are formed on the side walls of the
guiding rail) extend transversely in reference to the center line of the base[,
wherein the]. The base part of the slide transversely extends at the same angle.

[In this case] Therefore, one engaging edge formed on the inner retainer lock surface and the opposing engaging edge formed on one side wall of the guiding rail above the step that forms a guiding surface for the base part of the slide extend parallel in reference to the center line of the base of the guiding rail.

5 Due to these measures, a superior clamping effect of the engaging edges on the undercuts of the corrugated tube is achieved.

Brief Description of the Drawings

The invention is described in greater detail below with reference to the enclosed figures; the figures show:

10 Figure 1, a side view of a corrugated tube with undercuts for fixing the corrugated tube which extend in the longitudinal direction on its underside;

Figure 2, a view of the corrugated tube shown in Figure 1 which is directed onto one opening of the corrugated tube;

15 Figure 3, a perspective view of a fixing element according to the invention;

Figure 4, a side view of the fixing element shown in Figure 3;

Figure 5, a top view of the fixing element shown in Figure 3;

Figure 6, a cross section through the fixing element along the line of section VI-VI in Figure 4, namely with the fixing ridge clamped in position;

20 Figure 7, a top view of the base body of the fixing element shown in Figure 3;

Figure 8, a longitudinal section through the base body of the fixing element along the line of section VIII-VIII in Figure 7;

Figure 9, a cross section through the base body of the fixing element along the line of section IX-IX in Figure 8;

Figure 10, a top view of the slide of the fixing element shown in Figure 3;

5 Figure 11, a side view of the slide shown in Figure 10, and

Figure 12, a cross section through the slide along the line of section XII-XII in Figure 11.

Detailed Description

Referring now to Figures 1 and 2 [respectively show a generally known] there is shown a corrugated tube 1 in the form of a side view and a view that is directed onto one of the tube openings. The [typical] ribs 3, which provide the corrugated tube 1 with its flexibility, are produced by arranging circular grooves 2 in the outer surface of the tube. In Figures 1 and 2, the underside of the corrugated tube 1 is provided with two undercuts 4 that extend parallel to one another in the longitudinal direction in a mirror-inverted fashion such that a fixing ridge 5, which is integrally formed onto the outer surface of the corrugated tube 1, is created. The corrugated tube 1 can be cut open in the longitudinal direction such that a bundle of cables to be installed can be placed into the corrugated tube 1 [through the thusly formed slot that can be bent open]. One characteristic of the plastic material that is preferably used for the corrugated tube 1 is that the slot closes again after a bundle of cables is placed into the corrugated tube.

The corrugated tube 1 can be inserted or pressed into a fixing element that is arranged on a [not-shown] support part (not shown) [with] by its fixing ridge 5 in such a way that engaging members provided on the fixing element engage behind the undercuts 4 of the fixing ridge 5 [and a] to secure [retention of] the corrugated tube 1 on the support part [is achieved]. The slot for inserting the bundle of cables into the corrugated tube 1 is preferably produced outside of the fixing ridge 5, in particular, on the opposite side of the corrugated tube. Due to this measure, one or more bundles of cables can also be subsequently inserted into the corrugated tube 1. Naturally, it would also be possible to pull a bundle of cables through [the] a non-slotted corrugated tube 1 and to anchor the corrugated tube on the fixing element with its fixing ridge 5. In special applications, it may be necessary to arrange the slot in the fixing ridge 5. In this case, the slot is preferably produced along [the] a center line of the fixing ridge 5. After the fixing ridge 5 with its undercuts 4 is engaged with the engaging members of [the] a fixing element, the slot is compressed such that the corrugated tube 1 is held closed. This may provide an additional safety in certain instances.

In corrugated tubes 1 with a relatively small diameter and a relatively thin wall 6, the undercuts 4 also are accordingly small such that they frequently do not provide a sufficient engaging surface for known fixing elements [in order to ensure a truly secure retention on the support part]. Therefore, it is difficult to ensure that these small tubes are properly secured to the fixing

element and to the support part. The fixing element 7 according to the invention serves for eliminating this problem.

Referring now to Figure 3 [shows] there is shown a perspective representation of [the new] a fixing element 7[,] constructed in accordance with
5 the present invention. [and] Figure 4 shows a side view of the [same] fixing element 7. [This] Preferably, the fixing element 7 [essentially consists of] includes [two parts, namely] a base body 8 [with] having a guiding rail 9 and a fixing leg 10, [as well as] and a slide 11 having a retainer lock 12 (see also Figures 7-12). Figures 4, 6, 8 and 9 indicate that the base body 8 contains a
10 [generally known] fixing leg 10 that can be elastically deformed. The base body 8 [can be inserted] is insertable into an opening of a [not-shown] support part (not shown) with this fixing leg 10 and anchored therein. A circular collar 13 situated above the fixing leg 10 preferably serves [for respectively supporting] to support the base body 8 and the fixing element 7 on [the] a
15 surface of the support part.

[The] Preferably, the guiding rail 9 [which] extends in the longitudinal direction and is situated above [this] the collar 13. The guiding rail 9 [basically] has a cuboid shape, in the upper side of which is arranged a recess 14 that transversely extends in the longitudinal direction [is arranged]. This
20 means that a base 15 and two side walls 16, 17 remain, wherein one side wall 16 widens in the inserting direction P of the slide 11 [(see below)] and the other side wall 17 is tapered in the same direction.

5 The tapered side wall 17 contains an inwardly directed step 18 that is aligned with the base part 19 of the slide 11 in the connected state [and thus forms] to form a guiding surface for the slide 11 and a common support surface for the fixing ridge 5 (see Figure 6). A rectangular groove 20 that is raised in reference to the surface of the base 15 is formed underneath the step 18. [The] A free end of the side wall 17 is undercut in such a way that a tapered engaging edge 21 is formed that is directed inward and linearly extends in the longitudinal direction [is formed]. [This] The engaging edge 21 is able to engage behind one of the undercuts 4 on the fixing ridge 5 of a corrugated tube 10 1 as indicated in Figure 6.

15 A rectangular groove 22 that is also raised in reference to the surface of the base 15 is arranged in the opposite side wall 16 that widens in the inserting direction P, namely at the same height as the base part 19. An engaging tab 24 that is slightly bent upward and contains an upwardly directed locking tab 25 is formed on the front end of the base 15 by means of recesses 23 arranged on both sides of the tab 25 (see also Figures 7 and 8).

20 The slide 11 is arranged [where] such that it can be displaced in the [thus formed] guiding rail 9 of the base body 8 (see also Figures 10-12). The slide 11 [consists of] preferably includes an essentially flat base part 19 that is inclined at [a certain] an angle toward an actuating projection 26 which is integrally formed onto the base part 19 in the shape of a T[, wherein said]. Preferably, the angle of the slide 11 corresponds to the transversely extending recess 14 in the guiding rail 9 (see Figure 10). A retainer lock 12 that is

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tapered in the inserting direction P is integrally formed onto the surface of the base part 19. [The] Preferably, the retainer lock 12 is provided with its wedge shape [due to the fact that its] because the outer retainer lock surface 27 extends at the same angle as the base part 19 while [its] the inner retainer lock surface 28 extends perpendicular to the actuating projection 26 (see Figure 10).
5 The inner retainer lock surface 28 is undercut in such a way that, as soon as the slide 11 is inserted into the guiding rail 9, a second engaging edge 29 is created in a mirror-inverted fashion in reference to the engaging edge 21 on the side wall 17 of the guiding rail 9. As indicated in Figure 6, this second engaging edge 21 is preferably [able to engage] engageable behind the second undercut 4
10 on the fixing ridge 5 of a corrugated tube 1. [The] A lateral surface 31 of the base part 19 [which] that is arranged opposite to the retainer lock surface 27 preferably adjoins the lateral surface of the step 18 in the side wall 17 of the guiding rail 9.

15 The slide 11 can assume a disengaged position and an engaged position in the guiding rail 9. For this purpose, the slide 11 is preferably provided with two notches 32 or recesses that are spaced apart on its underside in the longitudinal direction [on its underside]. [The] A locking tab 25 on the elastic engaging tab 24 of the guiding rail 9 is able to engage into these notches 32
20 (see Figures 11 and 4). [The] A rear notch 32 preferably is arranged directly adjacent to the actuating projection 26. Figures 4 and 5 show the fixing element 7 in the disengaged position of the slide 11, i.e., the locking projection 25 of the engaging tab 24 is engaged with the front [recess] notch 32 which is

5 situated on the underside of the slide 11 at approximately half its length in the embodiment shown (Figure 11). This means that the slide 11 is respectively held in the base body 8 and the guiding rail 9 in a captive fashion in its disengaged position. In this case, the fixing element 7 is in its standby position.

10 Figure 3 indicates that the slide 11 is guided in the guiding rail 9 by means of guiding ridges 30 and 33 that laterally protrude from the base part 19. For this purpose, one rectangular groove 22 is arranged in the side wall 16 of the guiding rail 9 and another rectangular groove 20 is arranged underneath the step 18. The guiding ridges 30 and 33 are able to engage and slide into these grooves [and slide therein].

15 When using the fixing element 7, the fixing ridge 5 of a corrugated tube [according to] as shown in Figures 1 and 2[,] (e.g., a corrugated tube into which a bundle of cables was inserted in the previously described fashion)[,] is inserted or pressed into the guiding rail 9 that contains the disengaged slide 11 [with its fixing ridge 5, namely in such a way] such that the opposing engaging edges 21 and 29 on the [guide will] guiding rail 9 and the retainer lock 12 [of the slide 11] encompass the [guiding ridge [sic; fixing ridge]] fixing ridge 5 of the corrugated tube 1 at the undercuts 4 (see Figure 6). Subsequently, the slide 20 11 is inserted into the guiding rail 9 (in the direction of the arrow P) until the locking tab 25 of the elastic engaging tab 24 engages into the notch 32 situated closer to the actuating projection 26 on the base 15 of the guiding rail 9 [such that] to lock the slide 11 into an engaged position [is locked in this engaged

position]. Due to the wedge effect of the retainer lock 12, the distance between the engaging [edges] edge 21 on the side wall 17 of the guiding rail 9 and the inner retainer lock surface 28 of the retainer lock 12 is reduced when the slide 11 is inserted into the guiding rail 9 (see also Figure 12). [In this case]
5 Therefore, the engaging edges 21 and 29 are so tightly engaged with the undercuts 4 of the fixing ridge 5 of the corrugated tube 1 that a secure retention of the corrugated tube 1 in the fixing element 7 and consequently on a not-shown support part is also ensured [if the engaging surface for the engaging edges 21, 29 on the undercuts 4 is relatively small].

10

I claim:

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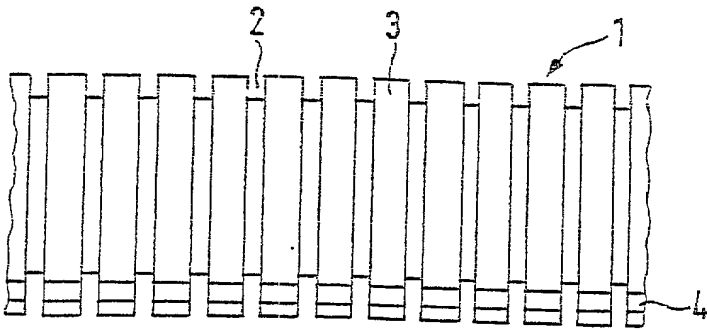


FIG. 1

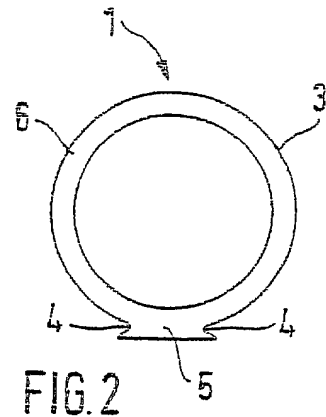


FIG. 2

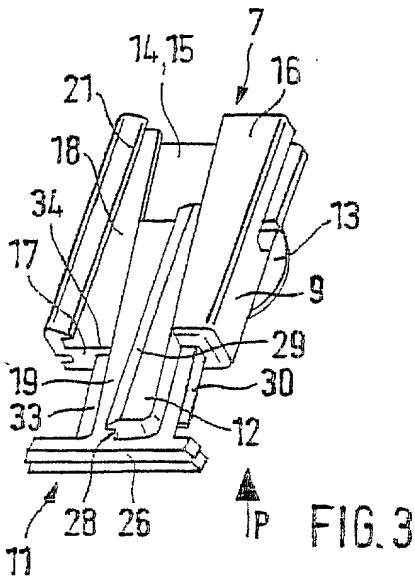


FIG. 3

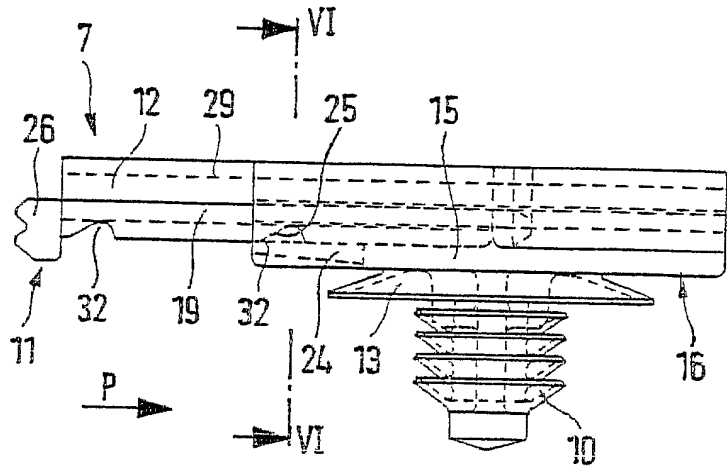


FIG. 4

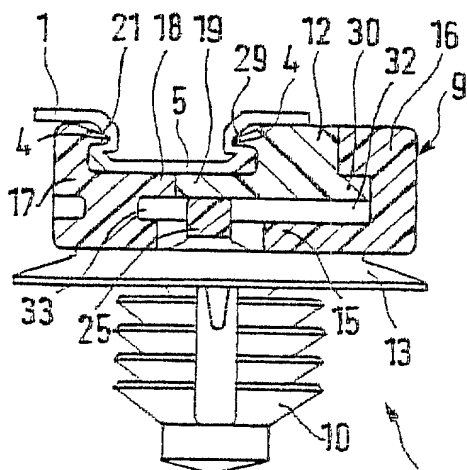


FIG. 6

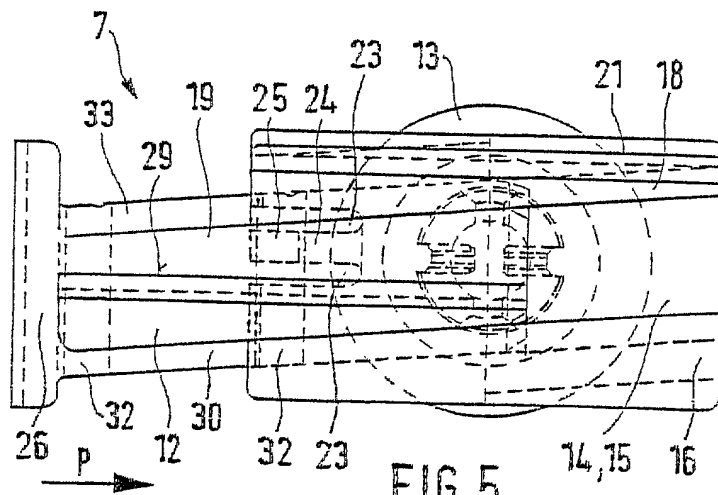


FIG. 5

FIG.7

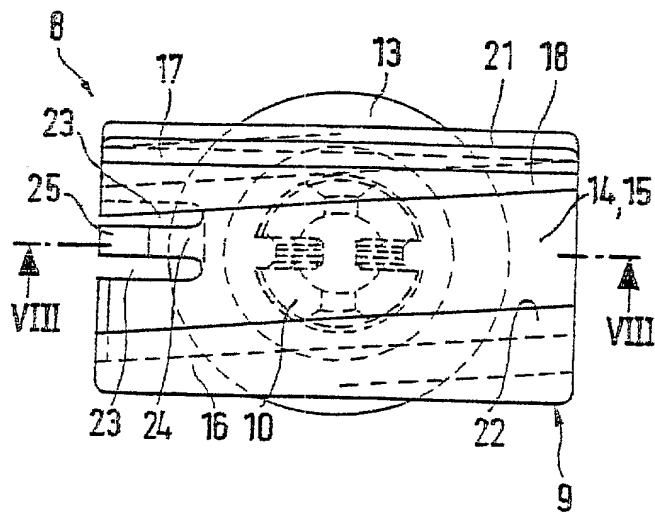


FIG.8

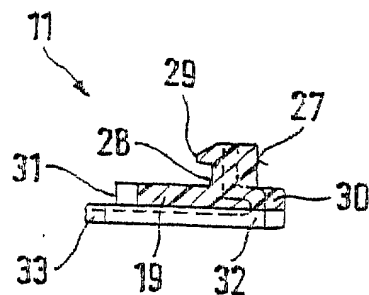
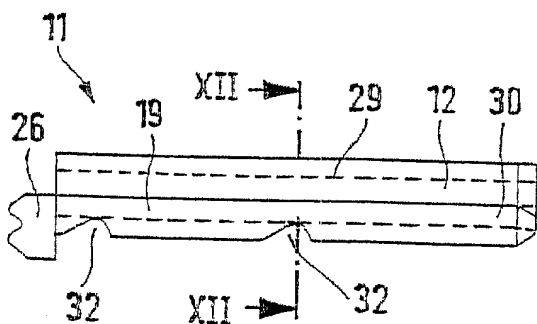
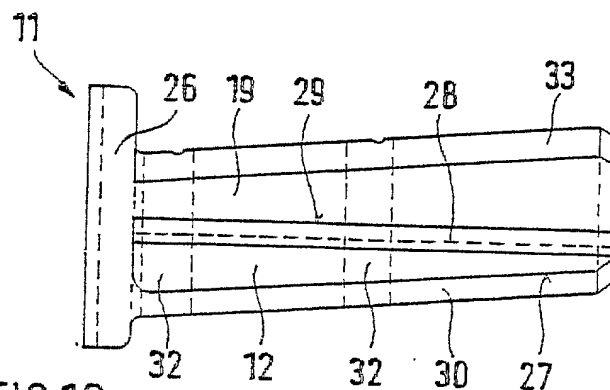
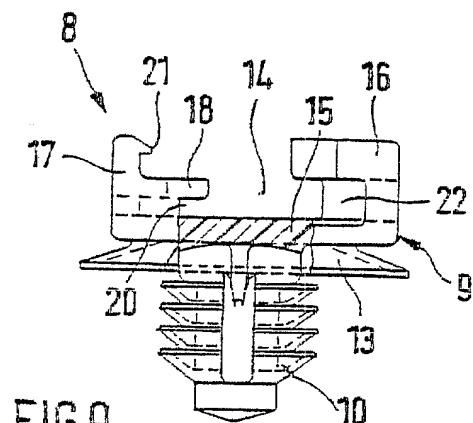
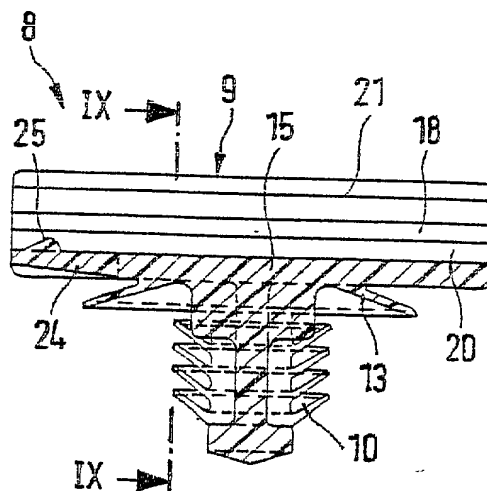


FIG.11

FIG.12

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FIXING ELEMENT FOR FIXING CORRUGATED TUBES TO A SUPPORT PART

Background of the Invention

Field of the Invention

5 The invention pertains to a fixing element for fixing corrugated tubes to a support part. The fixing element is connected to the support part by a fixing leg and includes engaging members that engage undercuts provided on the corrugated tube.

Reference to Related Art

10 Corrugated tubes are often used in the installation of electric lines or bundles of cables that extend or are installed along a support part. Due to the design of the corrugated tube (i.e., a tube with uniformly spaced apart circular grooves or ribs in its outer surface), the tubes are very flexible such that a bundle of cables can be arbitrarily installed in a space-saving fashion. For
15 example, the tube may be installed such that it follows the shape of a support part. In order to fix a corrugated tube with a bundle of cables situated therein at its intended location, the tube needs to be fixed to the support part at certain intervals. For this purpose, the ribbed outer surface of the corrugated tube is typically provided with two undercuts that extend parallel to one another in the
20 longitudinal direction in a mirror-inverted fashion. Fixing elements are then arranged on the support part at certain intervals and are engageable with the undercuts of the tube.

Corrugated tubes of this type are available with various diameters. In corrugated tubes with a relatively small diameter and an accordingly thin wall,

the above-mentioned undercuts also are relatively small such that they only provide a small engaging surface for a fixing clamp. Therefore the connection between the undercuts of the corrugated tubes and the fixing element may not be sufficiently secure to ensure proper installation of the tube.

5

Summary of the Invention

The invention is directed to a fixing element for securely and reliably attaching corrugated tubes having a relatively small diameter and undercuts (with an accordingly small depth) to a support part.

10

According to the invention, there is disclosed a fixing element having a guiding rail that is rigidly connected to the fixing leg of the fixing element. A slide with a retainer lock is tapered in the inserting direction and rigidly arranged on the slide and can be displaced in the guiding rail. Engaging edges that extend toward one another in a mirror-inverted fashion are formed on one side wall of the guiding rail and on the retainer lock surface of the retainer lock which is situated opposite to the aforementioned side wall of the guiding rail. The engaging edges are engageable with undercuts on the corrugated tube to be fixed. The undercuts extend parallel to one another in the longitudinal direction in a mirror-inverted fashion. The distance between the engaging edges is reduced when the slide is inserted into the guiding rail.

15
20

The slide can preferably assume two positions in the guiding rail. A disengaged position is characterized by the slide being partially pulled out of the guiding rail and the distance between the engaging edges being at its

greatest. An engaged position is characterized by the slide being inserted into the guiding rail and the distance between the engaging edges being reduced.

In the disengaged position of the slide, the undercuts of the corrugated tube to be fixed are engaged with the engaging edges that are integrally formed onto one side wall of the guiding rail and the opposing retainer lock surface of the retainer lock. Preferably, when the slide is inserted into the guiding rail, the distance between the two engaging edges is reduced (due to the wedge effect of the retainer lock arranged on the slide) such that the engagement with the undercuts on the corrugated tube is tightened and a secure retention of the corrugated tube is ensured.

Preferably, the guiding rail contains bottom and side walls with guiding surfaces for the slide. An engaging tab that is slightly bent upward and contains an upwardly directed locking tab is advantageously formed on the base of the guiding rail by means of recesses. Preferably, the engaging tab can be elastically engaged with notches provided on the underside of the slide which defined the disengaged position and the engaged position of the slide. Therefore, the slide is held in the guide rail in a captive fashion in its disengaged position and locked in its engaged position such that an unintentional disengaging of the corrugated tube from the fixing element is prevented.

According to a preferred embodiment of the invention, the slide has a flat base part that carries the retainer lock on its upper side. The slide is guided on guiding surfaces formed by the side wall of the guiding rail on one side and

by a step of the side wall of the guide rail on the other side by an outer retainer lock surface and an inner lateral surface of its base part.

5 The slide is preferably guided on one side in a rectangular groove formed in the side wall and on the other side in a rectangular groove formed underneath the step, namely by guiding ridges that laterally protrude from the base part.

10 The guiding surfaces for the slide (which are formed on the side walls of the guiding rail) extend transversely in reference to the center line of the base. The base part of the slide transversely extends at the same angle. Therefore, one engaging edge formed on the inner retainer lock surface and the opposing engaging edge formed on one side wall of the guiding rail above the step that forms a guiding surface for the base part of the slide extend parallel in reference to the center line of the base of the guiding rail. Due to these measures, a superior clamping effect of the engaging edges on the undercuts of
15 the corrugated tube is achieved.

Brief Description of the Drawings

The invention is described in greater detail below with reference to the enclosed figures; the figures show:

20 Figure 1, a side view of a corrugated tube with undercuts for fixing the corrugated tube which extend in the longitudinal direction on its underside;

Figure 2, a view of the corrugated tube shown in Figure 1 which is directed onto one opening of the corrugated tube;

Figure 3, a perspective view of a fixing element according to the invention;

Figure 4, a side view of the fixing element shown in Figure 3;

Figure 5, a top view of the fixing element shown in Figure 3;

5 Figure 6, a cross section through the fixing element along the line of section VI-VI in Figure 4, namely with the fixing ridge clamped in position;

Figure 7, a top view of the base body of the fixing element shown in Figure 3;

10 Figure 8, a longitudinal section through the base body of the fixing element along the line of section VIII-VIII in Figure 7;

Figure 9, a cross section through the base body of the fixing element along the line of section IX-IX in Figure 8;

Figure 10, a top view of the slide of the fixing element shown in Figure 3;

15 Figure 11, a side view of the slide shown in Figure 10, and

Figure 12, a cross section through the slide along the line of section XII-XII in Figure 11.

Detailed Description

20 Referring now to Figures 1 and 2 there is shown a corrugated tube 1 in the form of a side view and a view that is directed onto one of the tube openings. The ribs 3, which provide the corrugated tube 1 with its flexibility, are produced by arranging circular grooves 2 in the outer surface of the tube. In Figures 1 and 2, the underside of the corrugated tube 1 is provided with two

undercuts 4 that extend parallel to one another in the longitudinal direction in a mirror-inverted fashion such that a fixing ridge 5, which is integrally formed onto the outer surface of the corrugated tube 1, is created. The corrugated tube 1 can be cut open in the longitudinal direction such that a bundle of cables to
5 be installed can be placed into the corrugated tube 1. One characteristic of the plastic material that is preferably used for the corrugated tube 1 is that the slot closes again after a bundle of cables is placed into the corrugated tube.

The corrugated tube 1 can be inserted or pressed into a fixing element that is arranged on a support part (not shown) by its fixing ridge 5 in such a
10 way that engaging members provided on the fixing element engage behind the undercuts 4 of the fixing ridge 5 to secure the corrugated tube 1 on the support part. The slot for inserting the bundle of cables into the corrugated tube 1 is preferably produced outside of the fixing ridge 5, in particular, on the opposite side of the corrugated tube. Due to this measure, one or more bundles of cables
15 can also be subsequently inserted into the corrugated tube 1. Naturally, it would also be possible to pull a bundle of cables through a non-slotted corrugated tube 1 and to anchor the corrugated tube on the fixing element with its fixing ridge 5. In special applications, it may be necessary to arrange the slot in the fixing ridge 5. In this case, the slot is preferably produced along a
20 center line of the fixing ridge 5. After the fixing ridge 5 with its undercuts 4 is engaged with the engaging members of a fixing element, the slot is compressed such that the corrugated tube 1 is held closed. This may provide an additional safety in certain instances.

In corrugated tubes 1 with a relatively small diameter and a relatively thin wall 6, the undercuts 4 also are accordingly small such that they frequently do not provide a sufficient engaging surface for known fixing elements. Therefore, it is difficult to ensure that these small tubes are properly secured to the fixing element and to the support part. The fixing element 7 according to the invention serves for eliminating this problem.

Referring now to Figure 3 there is shown a perspective representation of a fixing element 7 constructed in accordance with the present invention. Figure 4 shows a side view of the fixing element 7. Preferably, the fixing element 7 includes a base body 8 having a guiding rail 9 and a fixing leg 10, and a slide 11 having a retainer lock 12 (see also Figures 7-12). Figures 4, 6, 8 and 9 indicate that the base body 8 contains a fixing leg 10 that can be elastically deformed. The base body 8 is insertable into an opening of a support part (not shown) with this fixing leg 10 and anchored therein. A circular collar 13 situated above the fixing leg 10 preferably serves to support the base body 8 and the fixing element 7 on a surface of the support part.

Preferably, the guiding rail 9 extends in the longitudinal direction and is situated above the collar 13. The guiding rail 9 has a cuboid shape, in the upper side of which is arranged a recess 14 that transversely extends in the longitudinal direction. This means that a base 15 and two side walls 16, 17 remain, wherein one side wall 16 widens in the inserting direction P of the slide 11 and the other side wall 17 is tapered in the same direction.

5 The tapered side wall 17 contains an inwardly directed step 18 that is aligned with the base part 19 of the slide 11 in the connected state to form a guiding surface for the slide 11 and a common support surface for the fixing ridge 5 (see Figure 6). A rectangular groove 20 that is raised in reference to the surface of the base 15 is formed underneath the step 18. A free end of the side wall 17 is undercut in such a way that a tapered engaging edge 21 is formed that is directed inward and linearly extends in the longitudinal direction. The engaging edge 21 is able to engage behind one of the undercuts 4 on the fixing ridge 5 of a corrugated tube 1 as indicated in Figure 6.

10 A rectangular groove 22 that is also raised in reference to the surface of the base 15 is arranged in the opposite side wall 16 that widens in the inserting direction P, namely at the same height as the base part 19. An engaging tab 24 that is slightly bent upward and contains an upwardly directed locking tab 25 is formed on the front end of the base 15 by means of recesses 23 arranged on
15 both sides of the tab 25 (see also Figures 7 and 8).

The slide 11 is arranged such that it can be displaced in the guiding rail 9 of the base body 8 (see also Figures 10-12). The slide 11 preferably includes an essentially flat base part 19 that is inclined at an angle toward an actuating projection 26 which is integrally formed onto the base part 19 in the shape of a
20 T. Preferably, the angle of the slide 11 corresponds to the transversely extending recess 14 in the guiding rail 9 (see Figure 10). A retainer lock 12 that is tapered in the inserting direction P is integrally formed onto the surface of the base part 19. Preferably, the retainer lock 12 is provided with its wedge

shape because the outer retainer lock surface 27 extends at the same angle as the base part 19 while the inner retainer lock surface 28 extends perpendicular to the actuating projection 26 (see Figure 10). The inner retainer lock surface 28 is undercut in such a way that, as soon as the slide 11 is inserted into the guiding rail 9, a second engaging edge 29 is created in a mirror-inverted fashion in reference to the engaging edge 21 on the side wall 17 of the guiding rail 9. As indicated in Figure 6, this second engaging edge 21 is preferably engageable behind the second undercut 4 on the fixing ridge 5 of a corrugated tube 1. A lateral surface 31 of the base part 19 that is arranged opposite to the retainer lock surface 27 preferably adjoins the lateral surface of the step 18 in the side wall 17 of the guiding rail 9.

The slide 11 can assume a disengaged position and an engaged position in the guiding rail 9. For this purpose, the slide 11 is preferably provided with two notches 32 or recesses that are spaced apart on its underside in the longitudinal direction. A locking tab 25 on the elastic engaging tab 24 of the guiding rail 9 is able to engage into these notches 32 (see Figures 11 and 4). A rear notch 32 preferably is arranged directly adjacent to the actuating projection 26. Figures 4 and 5 show the fixing element 7 in the disengaged position of the slide 11, i.e., the locking projection 25 of the engaging tab 24 is engaged with the front notch 32 which is situated on the underside of the slide 11 at approximately half its length in the embodiment shown (Figure 11). This means that the slide 11 is respectively held in the base body 8 and the guiding

rail 9 in a captive fashion in its disengaged position. In this case, the fixing element 7 is in its standby position.

Figure 3 indicates that the slide 11 is guided in the guiding rail 9 by means of guiding ridges 30 and 33 that laterally protrude from the base part 19.

5 For this purpose, one rectangular groove 22 is arranged in the side wall 16 of the guiding rail 9 and another rectangular groove 20 is arranged underneath the step 18. The guiding ridges 30 and 33 are able to engage and slide into these grooves.

When using the fixing element 7, the fixing ridge 5 of a corrugated tube
10 as shown in Figures 1 and 2 (e.g., a corrugated tube into which a bundle of cables was inserted in the previously described fashion) is inserted or pressed into the guiding rail 9 that contains the disengaged slide 11 such that the opposing engaging edges 21 and 29 on the guiding rail 9 and the retainer lock 12 encompass the fixing ridge 5 of the corrugated tube 1 at the undercuts 4 (see
15 Figure 6). Subsequently, the slide 11 is inserted into the guiding rail 9 (in the direction of the arrow P) until the locking tab 25 of the elastic engaging tab 24 engages into the notch 32 situated closer to the actuating projection 26 on the base 15 of the guiding rail 9 to lock the slide 11 into an engaged position. Due to the wedge effect of the retainer lock 12, the distance between the engaging
20 edge 21 on the side wall 17 of the guiding rail 9 and the inner retainer lock surface 28 of the retainer lock 12 is reduced when the slide 11 is inserted into the guiding rail 9 (see also Figure 12). Therefore, the engaging edges 21 and 29 are so tightly engaged with the undercuts 4 of the fixing ridge 5 of the

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corrugated tube 1 that a secure retention of the corrugated tube 1 in the fixing element 7 and consequently on a not-shown support part is also ensured.

I claim:

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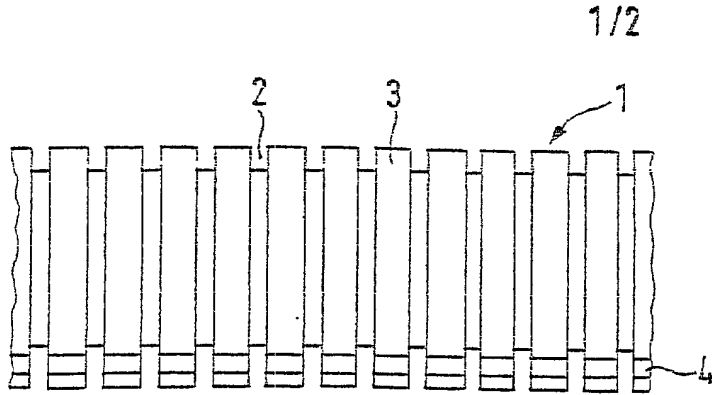


FIG. 1

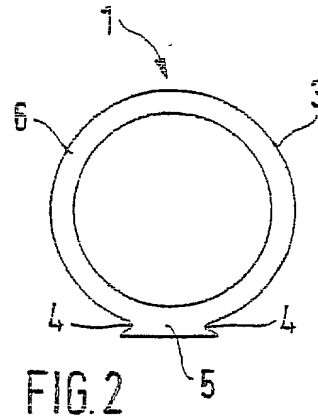


FIG. 2

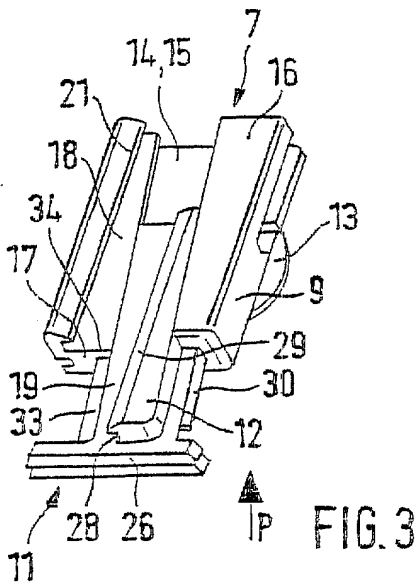


FIG. 3

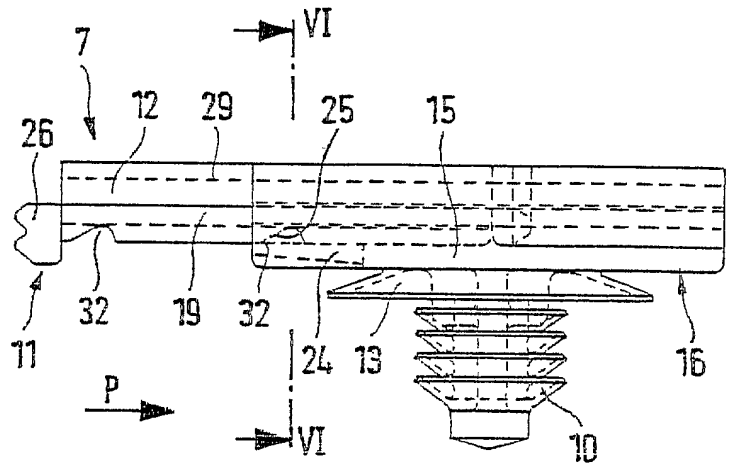


FIG. 4

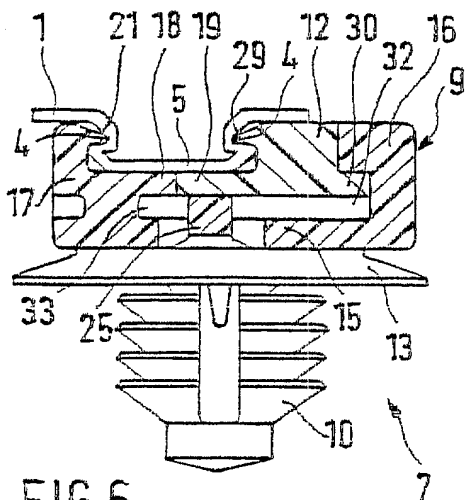


FIG. 6

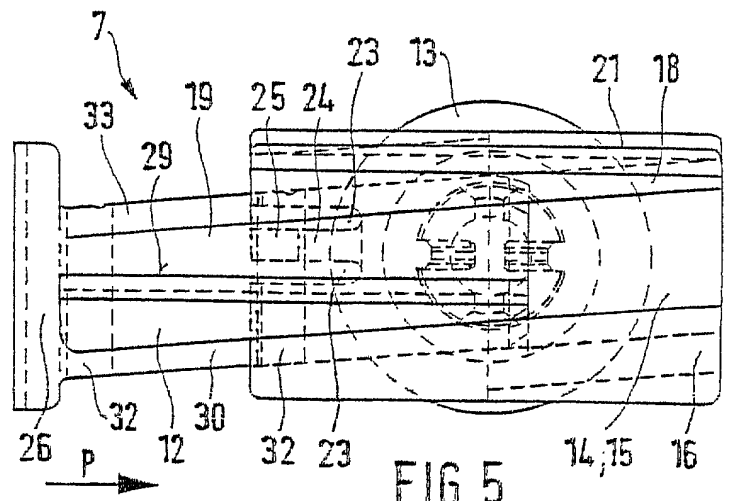


FIG. 5

FIG.7

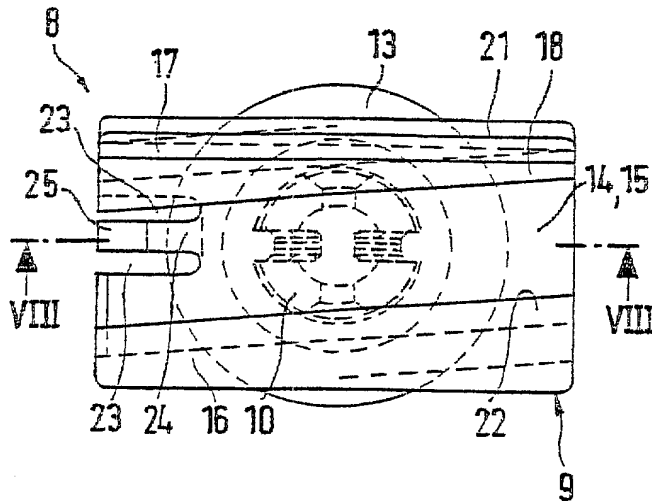


FIG.8

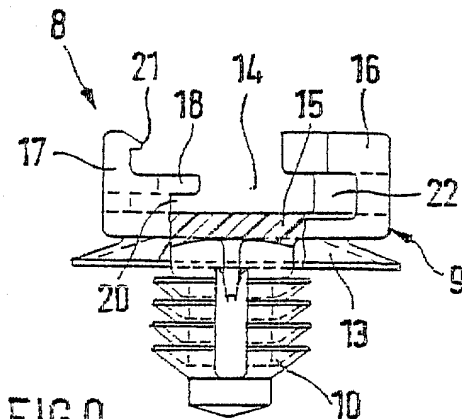
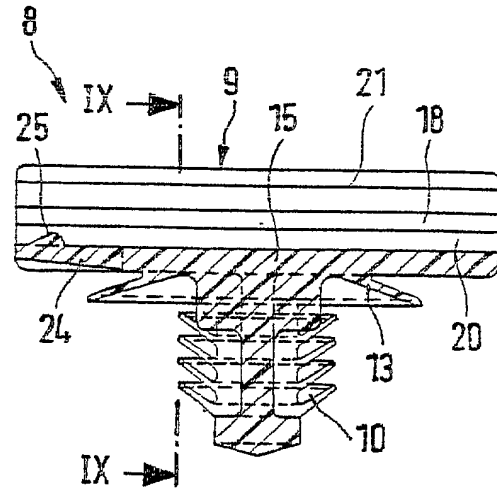


FIG.9

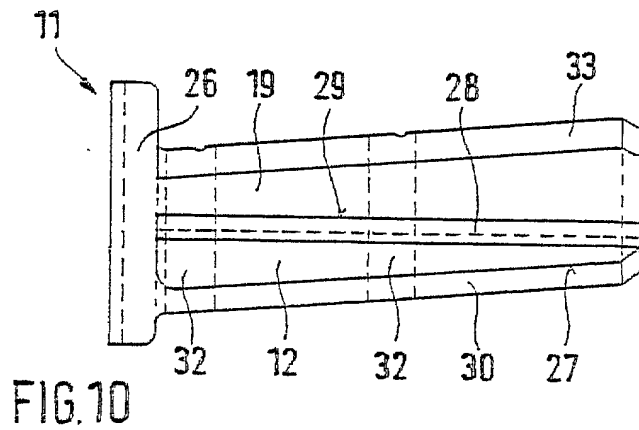


FIG.10

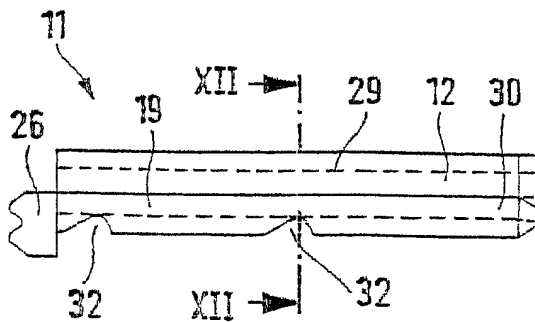


FIG.11

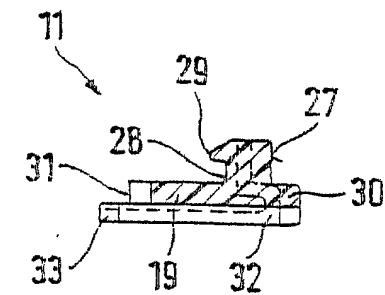


FIG.12

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**FIXING ELEMENT FOR FIXING
CORRUGATED TUBES TO A SUPPORT PART**

Description

5 The invention pertains to a fixing element for fixing corrugated tubes to a support part, wherein the fixing element can be connected to the support part by means of a fixing leg, and wherein the fixing element contains engaging members that can be engaged with undercuts provided on the corrugated tube.

Corrugated tubes serve, for example, for accommodating electric lines or bundles of cables that should extend or be installed along a support part.

10 Due to the design which is in the form of a corrugated tube, i.e., a tube with uniformly spaced apart circular grooves in its outer surface, tubes of this type are very flexible such that a bundle of cables can be arbitrarily installed in a space-saving fashion, e.g., such that it follows the shape of a support part, while being covered and protected. In order to fix a corrugated tube with a

15 bundle of cables situated therein at its intended location, it needs to be fixed to the support part in question within certain intervals. For this purpose, the ribbed outer surface of the corrugated tube is, for example, provided with two undercuts that extend parallel to one another in the longitudinal direction in a mirror-inverted fashion, wherein fixing elements arranged on the support part

20 within certain intervals are able to engage behind said undercuts.

Corrugated tubes of this type are available with various diameters. In corrugated tubes with a relatively small diameter and an accordingly thin wall, the above-mentioned undercuts also are relatively small such that they only

provide a small engaging surface for a fixing clamp and the connection may not appear sufficiently secure.

The invention is based on the objective of developing a fixing element for reliably fixing, in particular, corrugated tubes with a relatively small diameter and undercuts with an accordingly small depth to a support part.

According to the invention, this objective is attained due to the fact that a guiding rail is rigidly connected to the fixing leg of the fixing element, wherein a slide with a retainer lock that is tapered in the inserting direction and rigidly arranged on the slide can be displaced in said guiding rail, wherein engaging edges that extend toward one another in a mirror-inverted fashion are formed on one side wall of the guiding rail and on the retainer lock surface of the retainer lock which is situated opposite to the aforementioned side wall of the guiding rail, wherein said engaging edges can be engaged with undercuts on the corrugated tube to be fixed which extend parallel to one another in the longitudinal direction in a mirror-inverted fashion, and wherein the distance between the engaging edges is reduced when the slide is inserted into the guiding rail.

The slide can assume two positions in the guiding rail. The disengaged position is characterized by the slide being partially pulled out of the guiding rail and the distance between the engaging edges being at its greatest. The engaged position is characterized by the slide being inserted into the guiding rail and the distance between the engaging edges being reduced.

In the disengaged position of the slide, the undercuts of the corrugated tube to be fixed which extend parallel to one another in the longitudinal direction are engaged with the correspondingly spaced apart engaging edges that are integrally formed onto one side wall of the guiding rail and the opposing retainer lock surface of the retainer lock. When the slide is inserted into the guiding rail, the distance between the two engaging edges is reduced due to the wedge effect of the retainer lock arranged on the slide such that the engagement with the undercuts on the corrugated tube is tightened and a secure retention of the corrugated tube is also ensured if the engaging surface on the undercuts is relatively small.

The guiding rail contains bottom and side walls with guiding surfaces for the slide. An engaging tab that is slightly bent upward and contains an upwardly directed locking tab is advantageously formed on the base of the guiding rail by means of recesses, wherein said engaging tab can be elastically engaged with notches provided on the underside of the slide at a distance from one another which defines the disengaged position of the slide and at a distance from one another which defines the engaged position of the slide. Due to this measure, the slide is held in the guide rail in a captive fashion in its disengaged position and locked in its engaged position such that an unintentional disengaging of the corrugated tube from the fixing element is prevented.

According to one embodiment of the invention, the slide consists of a flat base part that carries the retainer lock on its upper side. The slide is guided on guiding surfaces formed by the side wall of the guiding rail on one side and

by a step of the side wall of the guide rail on the other side by means of an outer retainer lock surface and an inner lateral surface of its base part.

The slide is preferably guided on one side in a rectangular groove formed in the side wall and on the other side in a rectangular groove formed underneath the step, namely by means of guiding ridges that laterally protrude from the base part.

According to one preferred embodiment of the invention, the guiding surfaces for the slide which are formed on the side walls of the guiding rail extend transversely in reference to the center line of the base, wherein the base part of the slide transversely extends at the same angle. In this case, one engaging edge formed on the inner retainer lock surface and the opposing engaging edge formed on one side wall of the guiding rail above the step that forms a guiding surface for the base part of the slide extend parallel in reference to the center line of the base of the guiding rail. Due to these measures, a superior clamping effect of the engaging edges on the undercuts of the corrugated tube is achieved.

The invention is described in greater detail below with reference to the enclosed figures; the figures show:

Figure 1, a side view of a corrugated tube with undercuts for fixing the corrugated tube which extend in the longitudinal direction on its underside;

Figure 2, a view of the corrugated tube shown in Figure 1 which is directed onto one opening of the corrugated tube;

Figure 3, a perspective view of a fixing element according to the invention;

Figure 4, a side view of the fixing element shown in Figure 3;

Figure 5, a top view of the fixing element shown in Figure 3;

5 Figure 6, a cross section through the fixing element along the line of section VI-VI in Figure 4, namely with the fixing ridge clamped in position;

Figure 7, a top view of the base body of the fixing element shown in Figure 3;

10 Figure 8, a longitudinal section through the base body of the fixing element along the line of section VIII-VIII in Figure 7;

Figure 9, a cross section through the base body of the fixing element along the line of section IX-IX in Figure 8;

Figure 10, a top view of the slide of the fixing element shown in Figure 3;

15 Figure 11, a side view of the slide shown in Figure 10, and

Figure 12, a cross section through the slide along the line of section XII-XII in Figure 11.

20 Figures 1 and 2 respectively show a generally known corrugated tube 1 in the form of a side view and a view that is directed onto one of the tube openings. The typical ribs 3 which provide the corrugated tube 1 with its flexibility are produced by arranging circular grooves 2 in the outer surface. In Figures 1 and 2, the underside of the corrugated tube 1 is provided with two undercuts 4 that extend parallel to one another in the longitudinal direction in a

mirror-inverted fashion such that a fixing ridge 5 which is integrally formed onto the outer surface of the corrugated tube 1 is created. The corrugated tube 1 can be cut open in the longitudinal direction such that a bundle of cables to be installed can be placed into the corrugated tube 1 through the thusly formed slot that can be bent open. One characteristic of the plastic material that is preferably used for the corrugated tube 1 is that the slot closes again after a bundle of cables is placed into the corrugated tube.

The corrugated tube 1 can be inserted or pressed into a fixing element arranged on a not-shown support part with its fixing ridge 5 in such a way that engaging members provided on the fixing element engage behind the undercuts 4 of the fixing ridge 5 and a secure retention of the corrugated tube 1 on the support part is achieved. The slot for inserting the bundle of cables into the corrugated tube 1 is preferably produced outside of the fixing ridge 5, in particular, on the opposite side of the corrugated tube. Due to this measure, one or more bundles of cables can also be subsequently inserted into the corrugated tube 1. Naturally, it would also be possible to pull a bundle of cables through the non-slotted corrugated tube 1 and to anchor the corrugated tube on the fixing element with its fixing ridge 5. In special applications, it may be necessary to arrange the slot in the fixing ridge 5. In this case, the slot is preferably produced along the center line of the fixing ridge. After the fixing ridge 5 with its undercuts 4 is engaged with the engaging members of the fixing element, the slot is compressed such that the corrugated tube 1 is held closed. This may provide an additional safety in certain instances.

In corrugated tubes 1 with a relatively small diameter and a relatively thin wall 6, the undercuts 4 also are accordingly small such that they frequently do not provide a sufficient engaging surface for known fixing elements in order to ensure a truly secure retention on the support part. The fixing element 7 according to the invention serves for eliminating this problem.

Figure 3 shows a perspective representation of the new fixing element 7, and Figure 4 shows a side view of the same fixing element 7. This fixing element essentially consists of two parts, namely a base body 8 with a guiding rail 9 and a fixing leg 10, as well as a slide 11 with a retainer lock 12 (see also Figures 7-12). Figures 4, 6, 8 and 9 indicate that the base body 8 contains a generally known fixing leg 10 that can be elastically deformed. The base body can be inserted into an opening of a not-shown support part with this fixing leg and anchored therein. A circular collar 13 situated above the fixing leg 10 serves for respectively supporting the base body 8 and the fixing element 7 on the surface of the support part.

The guiding rail 9 which extends in the longitudinal direction is situated above this collar 13. The guiding rail 9 basically has a cuboid shape, in the upper side of which a recess 14 that transversely extends in the longitudinal direction is arranged. This means that a base 15 and two side walls 16, 17 remain, wherein one side wall 16 widens in the inserting direction P of the slide 11 (see below) and the other side wall 17 is tapered in the same direction.

The tapered side wall 17 contains an inwardly directed step 18 that is aligned with the base part 19 of the slide 11 in the connected state and thus

forms a guiding surface for the slide 11 and a common support surface for the fixing ridge 5 (see Figure 6). A rectangular groove 20 that is raised in reference to the surface of the base 15 is formed underneath the step 18. The free end of the side wall 17 is undercut in such a way that a tapered engaging edge 21 that
5 is directed inward and linearly extends in the longitudinal direction is formed. This engaging edge is able to engage behind one of the undercuts 4 on the fixing ridge 5 of a corrugated tube 1 as indicated in Figure 6.

A rectangular groove 22 that is also raised in reference to the surface of the base 15 is arranged in the opposite side wall 16 that widens in the inserting
10 direction P, namely at the same height as the base part 19. An engaging tab 24 that is slightly bent upward and contains an upwardly directed locking tab 25 is formed on the front end of the base 15 by means of recesses 23 arranged on both sides (see also Figures 7 and 8).

The slide 11 is arranged where it can be displaced in the thus formed
15 guiding rail 9 of the base body 8 (see also Figures 10-12). The slide consists of an essentially flat base part 19 that is inclined at a certain angle toward an actuating projection 26 which is integrally formed onto the base part in the shape of a T, wherein said angle corresponds to the transversely extending recess 14 in the guiding rail 9 (see Figure 10). A retainer lock 12 that is tapered
20 in the inserting direction P is integrally formed onto the surface of the base part 19. The retainer lock is provided with its wedge shape due to the fact that its outer retainer lock surface 27 extends at the same angle as the base part 19 while its inner retainer lock surface 28 extends perpendicular to the actuating

projection 26 (see Figure 10). The inner retainer lock surface 28 is undercut in such a way that, as soon as the slide 11 is inserted into the guiding rail 9, a second engaging edge 29 is created in a mirror-inverted fashion in reference to the engaging edge 21 on the side wall 17 of the guiding rail 9. As indicated in

5 Figure 6, this second engaging edge is able to engage behind the second undercut 4 on the fixing ridge 5 of a corrugated tube 1. The lateral surface 31 of the base part 19 which is arranged opposite to the retainer lock surface 27 adjoins the lateral surface of the step 18 in the side wall 17 of the guiding rail 9.

10 The slide 11 can assume a disengaged position and an engaged position in the guiding rail 9. For this purpose, the slide 11 is provided with two notches 32 that are spaced apart in the longitudinal direction on its underside. The locking tab 25 on the elastic engaging tab 24 of the guiding rail 9 is able to engage into these notches (see Figures 11 and 4). The rear notch preferably is

15 arranged directly adjacent to the actuating projection 26. Figures 4 and 5 show the fixing element 7 in the disengaged position of the slide 11, i.e., the locking projection 25 of the engaging tab 24 is engaged with the front recess 32 which is situated on the underside of the slide 11 at approximately half its length in the embodiment shown (Figure 11). This means that the slide 11 is respectively

20 held in the base body 8 and the guiding rail 9 in a captive fashion in its disengaged position. In this case, the fixing element 7 is in its standby position.

Figure 3 indicates that the slide 11 is guided in the guiding rail 9 by means of guiding ridges 30 and 33 that laterally protrude from the base part 19.

For this purpose, one rectangular groove 22 is arranged in the side wall 16 of the guiding rail 9 and another rectangular groove 20 is arranged underneath the step 18. The guiding ridges 30 and 33 are able to engage into these grooves and slide therein.

5 When using the fixing element 7, a corrugated tube according to Figures 1 and 2, e.g., a corrugated tube into which a bundle of cables was inserted in the previously described fashion, is inserted or pressed into the guiding rail 9 that contains the disengaged slide 11 with its fixing ridge 5, namely in such a way that the opposing engaging edges 21 and 29 on the guide
10 will 9 and the retainer lock 12 of the slide 11 encompass the guiding ridge [sic; fixing ridge] 5 of the corrugated tube 1 at the undercuts 4 (see Figure 6). Subsequently, the slide 11 is inserted into the guiding rail 9 in the direction of the arrow P until the locking tab 25 of the elastic engaging tab 24 engages into the notch 32 situated closer to the actuating projection 26 on the base 15 of the
15 guiding rail 9 such that the slide 11 is locked in this engaged position. Due to the wedge effect of the retainer lock 12, the distance between the engaging edges 21 on the side wall 17 of the guiding rail 9 and the inner retainer lock surface 28 of the retainer lock 12 is reduced when the slide 11 is inserted into the guiding rail 9 (see also Figure 12). In this case, the engaging edges 21 and
20 29 are so tightly engaged with the undercuts 4 of the fixing ridge 5 of the corrugated tube 1 that a secure retention of the corrugated tube 1 in the fixing element 7 and consequently on a not-shown support part is also ensured if the

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engaging surface for the engaging edges 21, 29 on the undercuts 4 is relatively small.

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Claims

1 1. Fixing element for fixing corrugated tubes to a support part,
2 wherein the fixing element can be connected to the support part by means of a
3 fixing leg, and wherein the fixing element contains engaging members that can
4 be engaged with undercuts provided on the corrugated tube, characterized by
5 the fact that a guiding rail (9) is rigidly connected to the fixing leg (10),
6 wherein a slide (11) with a retainer lock (12) that is rigidly arranged on the
7 slide and tapered in the inserting direction (P) can be displaced in the
8 aforementioned guiding rail, wherein engaging edges (21, 29) that are directed
9 toward one another in a mirror-inverted fashion are arranged on one side wall
10 (17) of the guiding rail (9) and on the retainer lock surface (28) of the retainer
11 lock (12) which is situated opposite to said side wall, wherein the engaging
12 edges can be engaged with undercuts (4) that extend parallel to one another in
13 the longitudinal direction in a mirror-inverted fashion on the corrugated tube
14 (1) to be fixed, and wherein the distance between said engaging edges is
15 reduced when the slide (11) is inserted into the guiding rail (9).

1 2. Fixing element according to Claim 1, characterized by the fact
2 that the slide (11) can assume two positions in the guiding rail (9), wherein the
3 slide (11) is partially pulled out of the guiding rail (9) and the distance between
4 the engaging edges (21, 29) is at its greatest in the disengaged position, and
5 wherein the slide (11) is inserted into the guiding rail (9) and the distance
6 between the engaging edges (21, 29) is reduced in the engaged position.

1 3. Fixing element according to Claim 2, characterized by the fact
2 that the guiding rail (9) contains a base (15) and side walls (16, 17) with
3 guiding surfaces for the slide (11), and by the fact that an engaging tab (24)
4 that is slightly bent upward and contains an upwardly directed locking tab (25)
5 is formed on the base (15) of the guiding rail (9) by means of recesses (23),
6 wherein said locking tab can be elastically engaged with notches (32) that are
7 provided on the underside of the slide (11) at a distance from one another that
8 defines the disengaged position and a distance from one another that defines
9 the engaged position of the slide (11).

1 4. Fixing element according to Claim 3, characterized by the fact
2 that the slide (11) consists of a flat base part (19) that carries the retainer lock
3 (12) on its upper side, and by the fact that the slide (11) is guided on guiding
4 surfaces by means of an outer retainer lock surface (27) and an inner lateral
5 surface (31) of its base part (19), wherein said guiding surfaces are formed by
6 the side wall (16) of the guiding rail (9) on one side and by a step (18) of the
7 side wall (17) of the guiding rail (9) on the other side.

1 5. Fixing element according to Claim 4, characterized by the fact
2 that the slide (11) is guided in a rectangular groove (22) formed in the side wall
3 (16) on one side and in a rectangular groove (20) formed underneath the step

4 (18) on the other side, namely by means of guiding ridges (30) and (33) that
5 laterally protrude from the base part (19).

1 6. Fixing element according to Claim 3 or 4, characterized by the
2 fact that the guiding surfaces for the slide (11) which are formed on the side
3 walls (16, 17) of the guiding rail (9) extend transversely in reference to the
4 center line of the base (15), wherein the base part (19) of the slide (11)
5 transversely extends at the same angle, and by the fact that the engaging edge
6 (29) formed on the inner retainer lock surface (28) and the other, opposing
7 engaging edge (21) formed on one side wall (17) of the guiding rail (9) above
8 the step (18) that forms one guiding surface for the base part (19) of the slide
9 (11) extend parallel in reference to the center line of the base (15) of the
10 guiding rail (9).

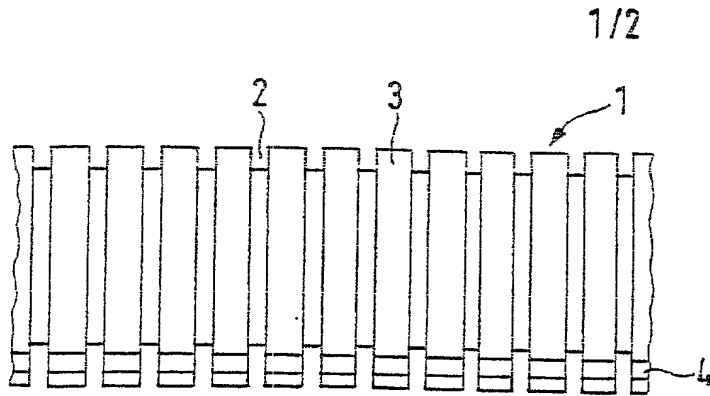


FIG. 1

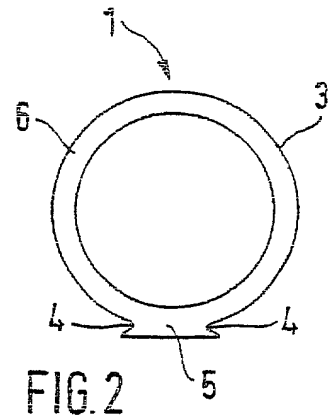


FIG. 2

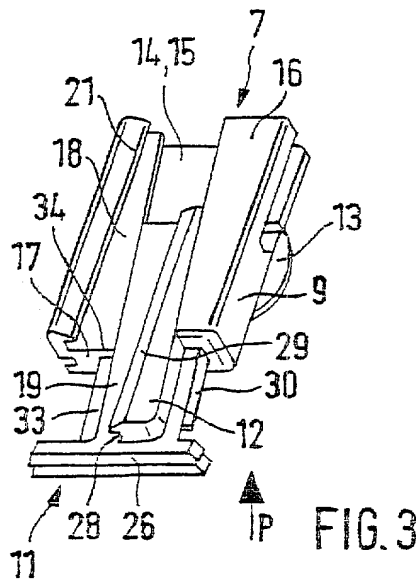


FIG. 3

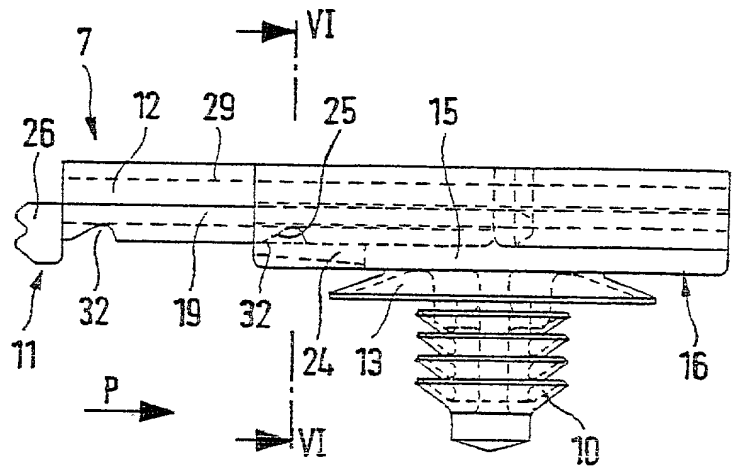


FIG. 4

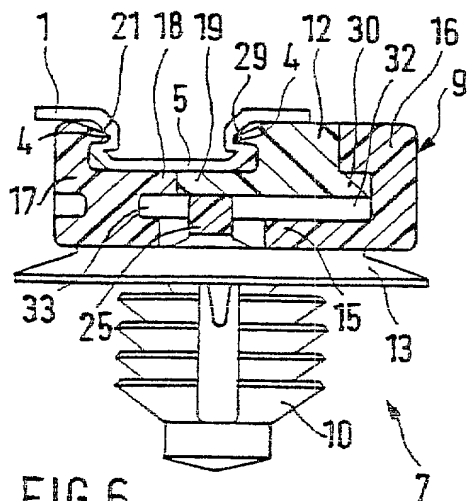


FIG. 6

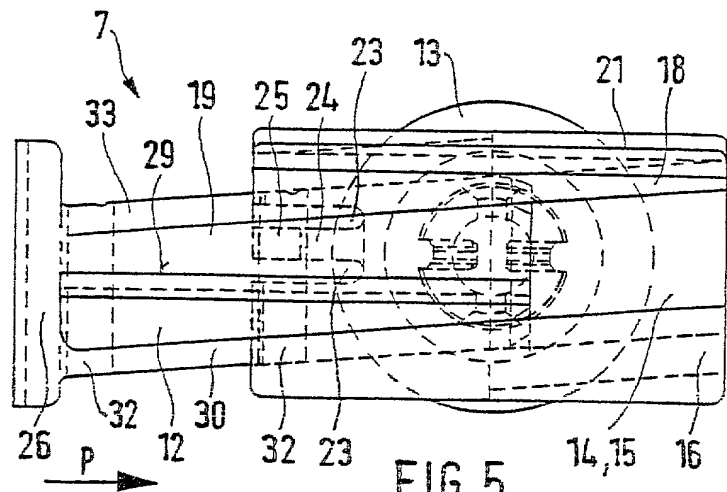


FIG. 5

FIG. 7

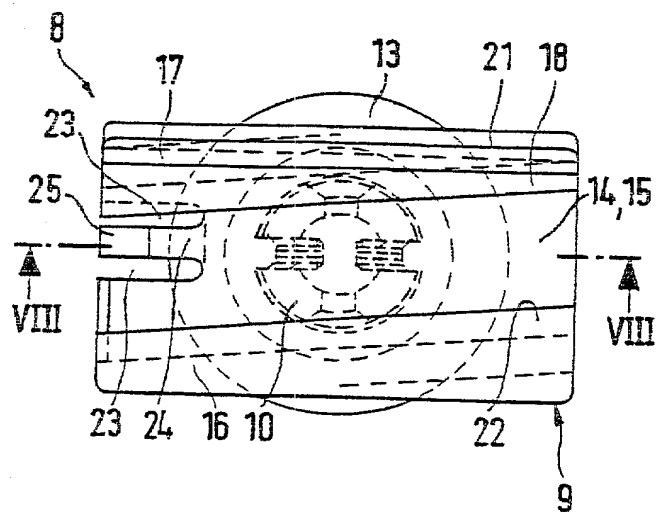


FIG. 8

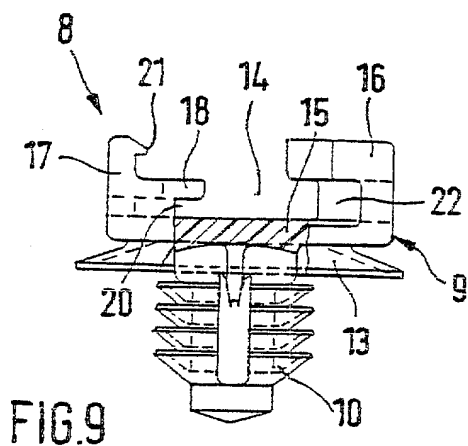
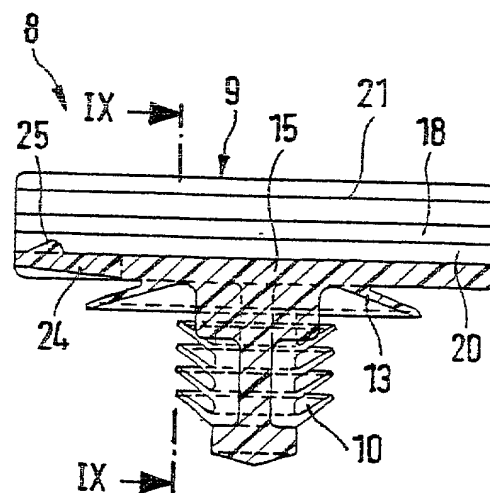


FIG. 9

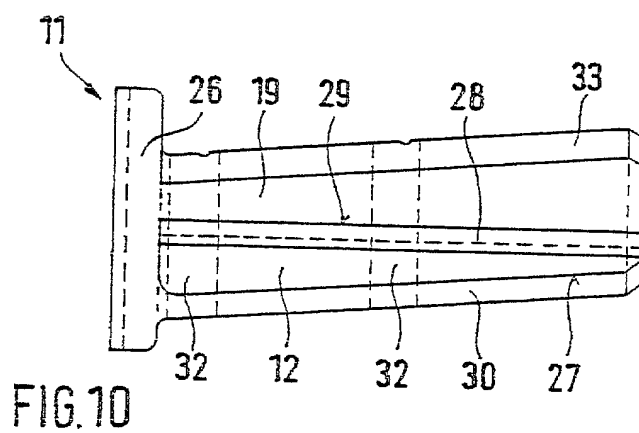


FIG. 10

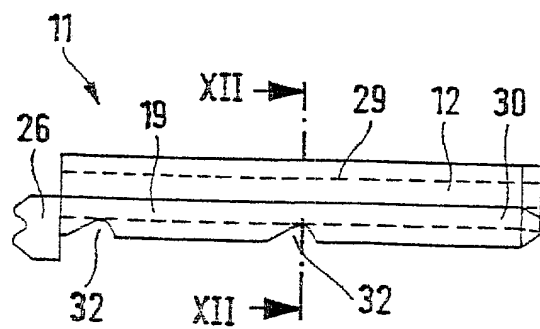


FIG. 11

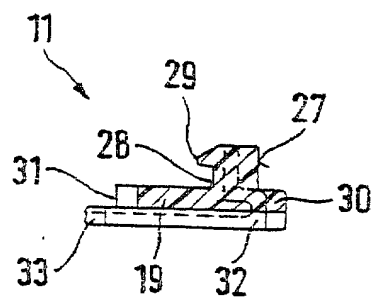


FIG. 12

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RAG-13902/08

Declaration and Power of Attorney For Patent Application

English Language Declaration

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled
FIXING ELEMENT FOR FIXING CORRUGATED TUBES TO A SUPPORT PART

the specification of which

(check one)

☐ is attached hereto.

☒ was filed on 6 JulyY 2000 as United States Application No. or PCT International
Application Number PCT/EP00/06384
and was amended on _____

(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365(b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)

Priority Not Claimed

199 34 262.8

Germany

21 July 1999

☐

(Number)

(Country)

(Day/Month/Year Filed)

☐

(Number)

(Country)

(Day/Month/Year Filed)

☐

(Number)

(Country)

(Day/Month/Year Filed)

I hereby claim the benefit under 35 U.S.C. Section 119(e) of any United States provisional

(Application Serial No.)

(Filing Date)

(Application Serial No.)

(Filing Date)

(Application Serial No.)

(Filing Date)

I hereby claim the benefit under 35 U. S. C. Section 120 of any United States application(s), or Section 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. Section 112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, C. F. R., Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

PCT/EP00/06384

6 July 2000

Pending

(Application Serial No.)

(Filing Date)

(Status)
(patented, pending, abandoned)

(Application Serial No.)

(Filing Date)

(Status)
(patented, pending, abandoned)

(Application Serial No.)

(Filing Date)

(Status)
(patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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